

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization  
International Bureau



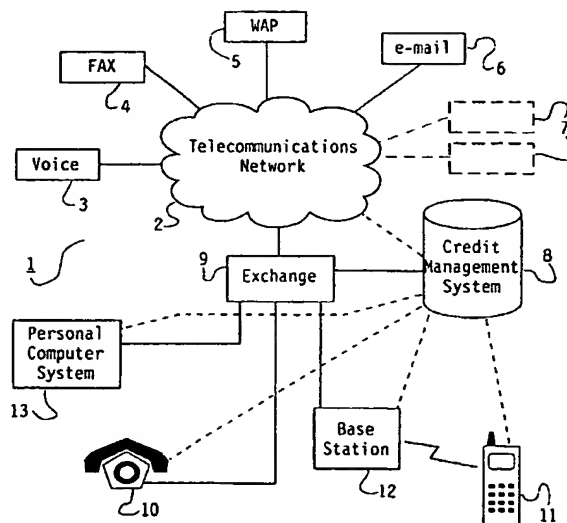
(43) International Publication Date  
17 July 2003 (17.07.2003)

PCT

(10) International Publication Number  
WO 03/058943 A1

- (51) International Patent Classification<sup>7</sup>: H04M 17/00, H04L 29/06, G06F 17/60
- (21) International Application Number: PCT/EP02/00382
- (22) International Filing Date: 9 January 2002 (09.01.2002)
- (25) Filing Language: English
- (26) Publication Language: English
- (71) Applicant (for all designated States except US): TELEFONAKTIEBOLAGET L M ERICSSON (PUBL) [SE/SE]; S-126 25 Stockholm (SE).
- (72) Inventor; and
- (75) Inventor/Applicant (for US only): LEWIS, Peter, Reginald [GB/NL]; P.O. BOX 8, NL-5120 AA Rijen (NL).
- (74) Agents: VAN KAN, J., J., H. et al.; Algemeen Octrooibureau, World Trade Center, Pastoor Petersstraat 160, NL-5612 LV Eindhoven (NL).
- (81) Designated States (national): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, OM, PH, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZM, ZW.
- (84) Designated States (regional): ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).
- Published:  
— with international search report
- For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: METHOD OF AND EQUIPMENT FOR CREDIT MANAGEMENT FOR ACCESS IN A TELECOMMUNICATIONS NETWORK



(57) Abstract: This invention describes a method for carrying out forced booking of reserved credits for the credit management of prepaid accounts within a multi service telecommunications environment. This method can be used in a multi service telecommunications environment (1), wherein a credit management system (8) is in communicative connection with a number of service provisioning systems (3-7), using a telecommunications network (2) and where at least one user of an account can access the network by both mobile and fixed access means (10, 11, 13), characterized in that the credit management system (8) is arranged for carrying out a forced booking in order to update account balance information.

Title

METHOD OF AND EQUIPMENT FOR CREDIT MANAGEMENT FOR ACCESS IN A TELE-  
COMMUNICATIONS NETWORK

5

Field of the Invention

The present invention relates generally to telecommunications systems and, more specifically, to credit management of accounts in a multi service telecommunications environment, wherein services are provided in exchange for credits.

Background of the Invention

The take up of prepaid subscriptions for mobile telephony has far exceeded anyone's expectations. Now in the light of 3G and true multi-service mobile networks it is likely that prepaid will take an ever greater stance. The introduction of prepaid into the fixed wireline networks is also likely.

Together with new technologies, the industry is experiencing consumer prices dropping to a level just above cost. The result of this is a significant increase in the level of service usage, e.g. the number of calls made.

The introduction of family prepaid accounts, where the one prepaid account has many users (mother, father, son, etc.), will complicate matters even more.

Moreover, the number of services offered is increasing rapidly, the number of users is still growing and the frequency and number of services accessed by each user is on the increase as well. Since most of these services are charged, the requirements placed on credit management systems (which responsibility is the financial

management of user accounts) are becoming more and more demanding. Multiple services need to be charged to one account, which can be accessed by multiple users at the same time.

5 In order to reduce the load on the credit management system, each service capability server, e.g. a service control point (SCP) for telephony calls or a wireless application protocol (WAP) gateway is likely to make use of credit control protocols which effectively reserve chunks of credit for the sole use of that service. For example, during a WAP session the WAP gateway may reserve 10 euros  
10 from the credit management system.

Credit reservation can also be a requirement for service deployment when the cost of the service cannot be determined based on a linear expression of time. For example, in charging for web access, where some web pages cost more than others, it is unknown how many pages will  
15 be accessed per minute and which pages will be accessed. Credit reservation ensures that services can be deployed with minimum delay.

Given the present situation, where multiple services can be accessed at the same time by one or more users, accordingly multiple credit reservations are placed against the same account at the same time.

20 It will be understood that a credit reservation differs from direct deduction of consumed credit from the account. Eventually, in the case of multiple credit reservations, a situation may occur where the credit management system shows a small amount of unreserved credits available and a service capability server requests to reserve or deduct a  
25 number of credits exceeding that left over. In this case the service is denied while the user is informed of the fact that there are insufficient credits available for that service. In fact, however, there are sufficient credits available, but these are all reserved for usage by other services.

30 Known solutions are either to have one server handling prepaid access for all services or alternatively not to allow credit to

be reserved. However, the disadvantages of prior art is that neither option is suitable in a multi-service network.

5 The use of one service capability server handling all services is not feasible from an architectural point of view when discussing the large number of services available for mobile and fixed telephony and internet services.

10 The ability for service capability servers to reserve credit improves service delivery to the end-user and ensures availability of the credit management system to other users and servers. Removing the credit reservation facility will create serious architectural and performance issues.

#### Summary of the Invention

15 It is an object of the present invention to provide a system for and a method of handling credit reservations that reduce the amount of erroneous denials of service by service provisioning means to the user, whilst maintaining the benefits of the existing architectural design, i.e. performance due to credit reservation and multiple service  
20 capability servers.

Another object the present invention, related to this, is improvement of quality of service, contributing to customer satisfaction.

25 These and other objects and advantages of the present invention are provided by a method for credit management of an account in a multi service telecommunications system, wherein services are provided in exchange for units, wherein a predetermined amount of units is available for the account and which units are reserved before provisioning of a service, characterized in that a forced booking of actually consumed units can be carried out.

30 By carrying out forced booking of consumed credits the credit management system can send a message to all service capability

servers connected to an account, force them to book all the consumed credits and release the remaining credits. This ensures that the total balance in the account is up to date at the moment the forced booking has taken place. A forced booking could possibly take place as soon as the amount of credits in the account drops below a certain threshold.

If, following upon a forced booking, a forced credit accreditation request is being demanded by the credit management system, the service capability servers are informed of the availability of credits in the account and will place requests for credit at the credit management system. The credit management system will receive all outstanding requests and will start an accreditation procedure.

During the accreditation procedure the credit management system will be enabled to optimise distribution of available credits by using accreditation rules to evaluate the requests. For example, these accreditation rules can be based on history information like actual consumption of credits per unit of time, a classification of services (prioritization), the amount of credits requested, the life-span of the request (for how long it will be reserved) or any other desired parameter for optimisation.

By analysing these and other factors an appropriate amount can be accredited to the service capability server, the main principle being that upon accreditation each server is provided less credits than previously held before the forced booking. It is thus less likely that service will inappropriately be refused due to lack of funds, in case a small amount of credits is remaining in the account. As the credit balance approaches zero, various services (using a service classification) can be refused credit if multiple services are active at the same time.

The advantages of using this method are numerous. The number of incorrect denials of service will be reduced substantially, improving the quality of service to the user. Of course this will result

in improved customer satisfaction. Still, the performance benefits of credit reservation are maintained by allowing these reservations. In addition, the requirement of multiple service capability servers is met as well.

5                   In an embodiment of the invention, a forced booking can be carried out by credit management, in order to force service provisioning means to book all consumed credits and release their reservations. This will enable credit management to update balance information of the account in order to rule out the possibility of providing incorrect  
10 information to the customer and thus avoid denial of service where inapplicable.

                  If this forced booking would be performed only in case the amount of credits drops below a predetermined threshold, the performance of a credit management means would not be disturbed too much.

15                   In a further embodiment of the invention the forced booking could be made service dependent, for instance only the services with large outstanding credit reservations are forced to book their consumed credits. This approach could as well improve performance of the invention as it reduces the amount of bookings to be handled and does not require  
20 attention from all service provisioning means.

                  In yet another embodiment, the forced booking can be followed up by a request from the credit management means to the service provisioning means to place new accreditation requests for credit. This will avoid interference with the service provisioning processes as the  
25 service provisioning means will be able to build up a credit reserve again.

                  In addition, accreditation of these requests can be done according to accreditation rules that enable credit management to determine the most optimal distribution of credits amongst the service  
30 provisioning means.

                  These rules could be dependent on any parameter that

requires optimisation, which of is an inexhaustible list dependent on the requirements of the telecommunications system as a whole. A number of possibilities is provided here as an example:

- 5           >rate of credit consumption of a service,
- >classification, for instance a prioritization, of services,
- >requested amount of credits,
- >life span of the request (is the amount requested for 1 minute or 10 minutes).

10           It will be appreciated that, in an embodiment of the invention, said credits are monetary units, units of time, units of volume, for instance data volume of data transmitted through a network or maybe dependent on the amount of used bandwidth by the user of the account.

15           The account could in another embodiment of the invention be accessed by multiple users, if desired, at the same time.

          The services could be related to a group which comprises voice, data and internet communications. Specific examples of said services are voice telephony, email, WAP, facsimile services, multimedia  
20           services, etc.

          The invention could in an alternative embodiment be used in a telecommunications network which can be accessed by users via both fixed and wireless connections.

25           Said telecommunication system, in an embodiment of the invention, could comprise a plurality of service provisioning systems, in communicative connection to said credit management.

          Specifically, the invention could be part of a multi  
service telecommunications system, wherein services are provided in exchange for units, wherein a predetermined amount of units is available  
30           for the account and which units are reserved before provisioning of a service, wherein the credit of available units for the account is being

registered or managed by at least one credit management system.

Credit management of the invention could be a system or even a part of a system that is part of the telecommunications system as a whole. Of course alternatively, credit management can be performed at the user's premises, in the equipment used to access the network, or any other device in communicative connection with said telecommunications system.

#### Brief Description of the Drawings

FIGURE 1 shows a multi service telecommunications network including credit management according to the invention

FIGURE 2 shows a process flow diagram of the forced booking method according to the invention.

#### Detailed Description of the Embodiments

Figure 1 shows a multi service telecommunications network 1, which comprises a network 2 (comprising a set of exchanges, routers and other equipment physically connected with each other) a plurality of service provisioning gateways 3-7, providing services such as voice services 3, fax services 4, WAP services 5, e-mail services 6, and others 7 generally indicated by broken lines in fig. 1. It further comprises a credit management system 8, an exchange enabling access to the network, a base station 12 required to establish a wireless connection between mobile communications means 11 and exchange 9, fixed communications means 10 and a personal computer system 13. The credit management system 8, here connected to exchange 9, could be connected directly to or be part of the communications means 10-11 and 13, base station 12, any of the service gateways 3-7 or any other device in the network. In this figure the alternative connections for 8 are shown as dotted lines.

Suppose a single account can be accessed by any of the



means 10, 11 and 13 at any time and any of these means 10, 11 and 13 can make use of any of the services 3-7 at the same time. When mobile communications means 11 accesses the network through base station 12 and requests any of the services 3-7, for instance WAP 5, the service gateway 5 submits a credit reservation request at the credit management system 8 which determines whether the amount of credits is sufficient to accept the reservation. If, for instance, the reservation is accepted, the credit management system 8 notifies the WAP gateway 5 of the acceptance and the gateway provides service to the user at mobile communications means 11.

If, following upon WAP service provisioning to mobile communications means 11, personal computer system 13 requests e-mail services 6 while mobile user 11 is still using WAP (and maybe more services are requested by any of the users at 10, 11 and 13 at the same time), the credit management system 8 might discover there are insufficient credits still available for reservation. Credit management system 8 will force booking of all consumed credits and at the same time release all outstanding reservations, upon which the credit management system 13 updates the account balance information. The credit management system 8 will then request each of service gateways 3-7 to submit new credit accreditation requests (reservations) after which, upon receiving of the requests, the credit management system will evaluate all the requests using a set of accreditation rules.

The set of rules used to evaluate all requests and to accredit amounts of credit to service gateways 3-7, can be based on a inexhaustible number of desirable parameters to optimise. For example, the rules can be based on history information like credit consumption rate, a classification of services like a prioritization of services (voice could be more important to a user than WAP), the amount of credits requested, the life-span of the request (for how long is will the requested amount be reserved) or any other parameter.

With these rules, the credit management system 8 can decide upon the most optimal distribution of credits amongst the service gateways 3-7. The service gateways will then provide service to the user (or deny service in case the account is empty). The user will not  
5 experience denial of service unless his/her balance really is insufficient.

Figure 2 shows a typical process flow chart of the method according to the invention. As it is a communications protocol between service provisioning means 15 and credit management means 16, the  
10 flowchart shows where the events are happening on either sides of the dotted line.

The process starts with any service provisioning means 15 placing a credit request (reservation) 17 at credit management system 16. The credit management system 16, upon receiving the request, checks the  
15 balance of the account in step 18 and in case the balance check is positive the reservation is accepted 19 and service is provided 20. In case the balance check 18 shows a negative result, the credit management system carries out a forced booking 21a of all consumed credits, the service provisioning means 16 will book all consumed credits and release  
20 outstanding reservations in step 21b. The credit management system 16 then forces all service provisioning means 16 to submit their new credit accreditation requests in step 22, which requests are placed in step 23. After receiving these requests, the credit management system 16 will in step 24 evaluate all requests making use of a set of accreditation rules.  
25 These rules are dependent on and determined by the parameters that are desired to optimise distribution of credits 25 for. When all credit amounts are determined the credit management system 16 will distribute 25 the amounts amongst service provisioning means 15 which will on their turn provide service to the user in terminal step 26.

30 It will be appreciated that numerous modifications and variations of the present invention are possible in the light of the

above teachings. It is therefore understood that within the scope of the appended claims, the invention may be practised otherwise than as specifically described herein.

Claims

1. A method for credit management of an account in a multi service telecommunications system, wherein services are provided in exchange for units, wherein a predetermined amount of units is available for the account and which units are reserved before provisioning of a service, characterized in that a forced booking of actually consumed units can be carried out.
2. A method according to claim 1, wherein said forced booking is carried out if said amount of unit drops below a predetermined threshold.
3. A method according to any of the previous claims, wherein said forced booking is service dependent.
4. A method according to any of the previous claims, wherein in connection with said forced booking a request for accreditation of units can be carried out for said services.
5. A method according to any of the previous claims, wherein accreditation of said units is subject to a plurality of accreditation rules.
6. A method according to claim 5, in which at least one of said accreditation rules is dependent on the actual use of said units per unit of time per service.
7. A method according to claim 5, in which at least one of said accreditation rules is dependent on a classification of said services.
8. A method according to claim 7, wherein said classification is a prioritization.
9. A method according to claim 5, in which at least one of said accreditation rules is dependent on the amount of units requested.
10. A method according to claim 5, in which at least one of said accreditation rules is dependent on the life-span of requested

units.

11. A method according to any of the previous claims, wherein said units are monetary units.

12. A method according to any of the claims 1-10, wherein said  
5 units are units of time.

13. A method according to any of the claims 1-10, wherein said units are units of volume.

14. A method according to claim 13, wherein said volume is a data volume.

10 15. A method according to any of the claims 1-10, wherein said units relate to the amount of used bandwidth.

16. A method according to any of the previous claims, wherein said account can be accessed by at least one user.

17. A method according to any of the previous claims, which is  
15 used in a telecommunications environment, wherein at least one of the services provided relates to a group comprising voice, data and internet communications.

18. A method as described in any of the preceding claims, wherein said telecommunications environment is accessible via a group  
20 comprising wireless and fixed connections to a telecommunications network.

19. A method according to any of the previous claims, wherein management or provisioning of said services is carried out by a plurality of service provisioning systems which are in communicative connection  
25 with said credit management.

20. A multi service telecommunications system, wherein services are provided in exchange for units, wherein a predetermined amount of units is available for the account and which units are reserved before provisioning of a service, wherein the credit of available units for the  
30 account is being registered or managed by at least one credit management system, characterized in that said credit management system is arranged

for carrying out a forced booking of actually consumed units.

21. A system according to claim 20, in which said credit management system is or is a part of a device comprised in said telecommunication system.

- 5 22. A system according to claim 20, in which said credit management system is or is part of a user device comprised in an arrangement for connecting to said telecommunications system.

10/500770

1/2

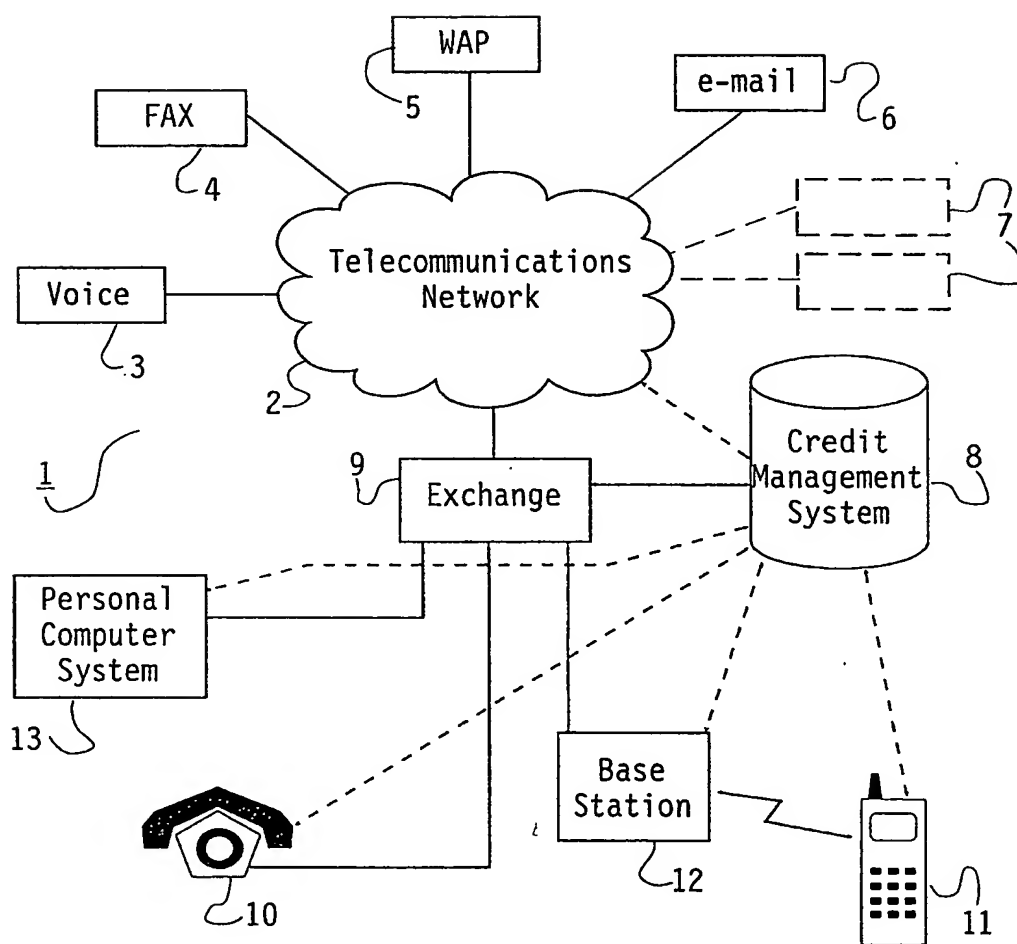
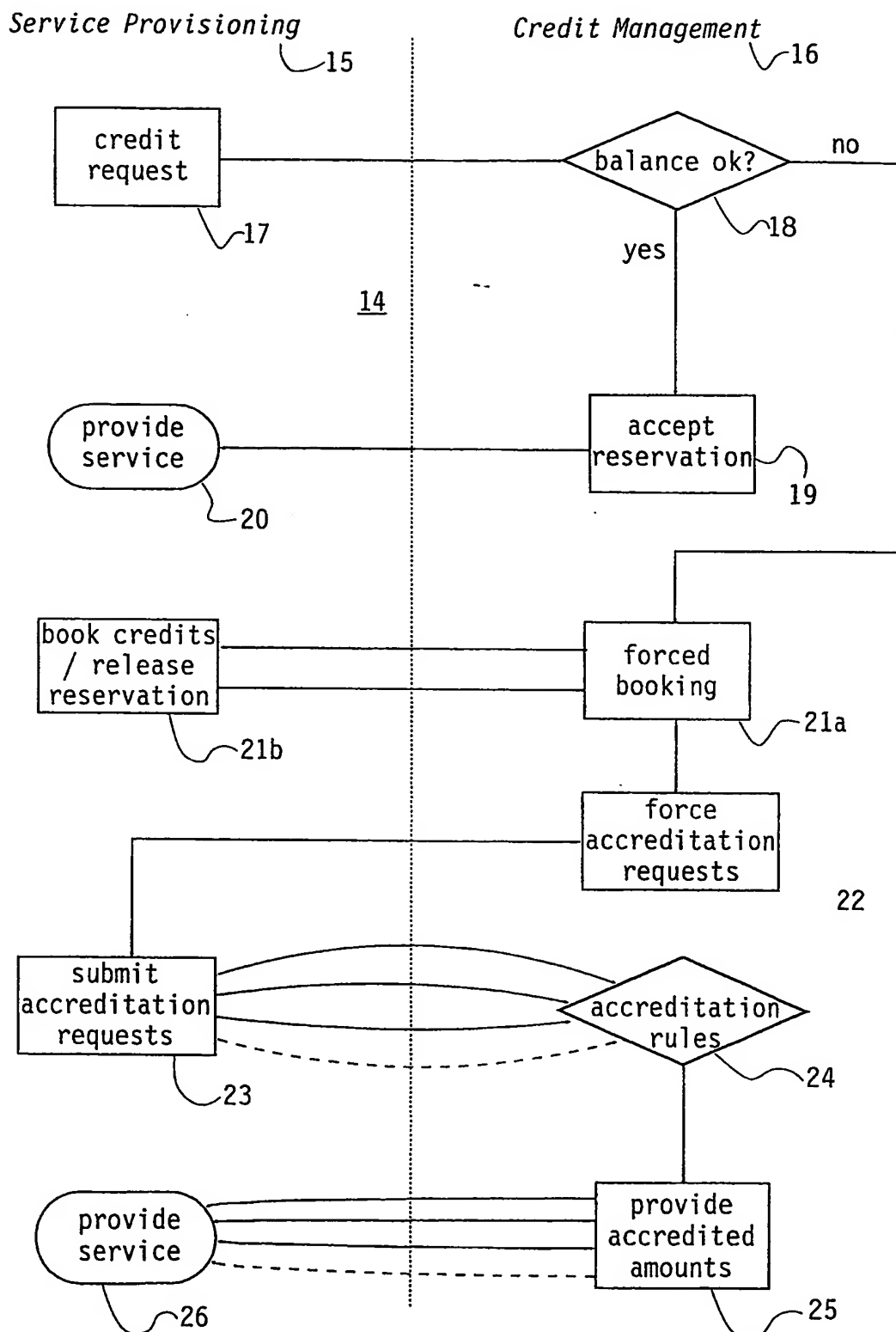


Fig. 1





## INTERNATIONAL SEARCH REPORT

International Application No.

P 02/00382

A. CLASSIFICATION OF SUBJECT MATTER  
 IPC 7 H04M17/00 H04L29/06 G06F17/60

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)  
 IPC 7 H04M H04L G06F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data, PAJ

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X Y	US 5 453 982 A (PENNINGTON RICKY J ET AL) 26 September 1995 (1995-09-26) abstract  column 2, line 24 - line 39 column 3, line 1 - line 36 column 4, line 36 - column 5, line 26 column 6, line 10 - column 7, line 49 ---	1,20  2-19,21, 22
X Y	WO 98 56160 A (ERICSSON TELEFON AB L M) 10 December 1998 (1998-12-10) abstract  page 5, line 11 - line 27 page 6, line 12 - page 7, line 4 page 8, line 27 - page 9, line 9 page 10, line 21 - page 11, line 15 page 12, line 20 - page 13, line 5 ---	1,20  2-19,21, 22
	--- -/-	

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

## \* Special categories of cited documents :

- \*A\* document defining the general state of the art which is not considered to be of particular relevance
- \*E\* earlier document but published on or after the international filing date
- \*L\* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- \*O\* document referring to an oral disclosure, use, exhibition or other means
- \*P\* document published prior to the international filing date but later than the priority date claimed

- \*T\* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- \*X\* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- \*Y\* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
- \*&\* document member of the same patent family

Date of the actual completion of the international search

24 September 2002

Date of mailing of the international search report

08/10/2002

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2  
 NL - 2280 HV Rijswijk  
 Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,  
 Fax: (+31-70) 340-3016

Authorized officer

Kahl, M

# INTERNATIONAL SEARCH REPORT

International Application No.

PCT/EP 02/00382

## C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	<p>US 6 151 688 A (MURPHY DAVID ET AL)  21 November 2000 (2000-11-21)  abstract  column 3, line 41 - line 62  column 8, line 31 -column 9, line 6  column 15, line 21 -column 16, line 17  -----</p>	1,20

# INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PC 02/00382

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
US 5453982	A	26-09-1995	NONE	
WO 9856160	A	10-12-1998	US 5995822 A	30-11-1999
			AU 736559 B2	02-08-2001
			AU 8043998 A	21-12-1998
			BR 9809719 A	11-07-2000
			CN 1259258 T	05-07-2000
			EP 0986890 A1	22-03-2000
			WO 9856160 A1	10-12-1998
			TR 9902867 T2	21-04-2000
			TW 390086 B	11-05-2000
US 6151688	A	21-11-2000	US 6338112 B1	08-01-2002
			US 6353898 B1	05-03-2002